Weeds A.4.1/1984
Farming in South Africa
(Reprinted 1987)

THE USE OF INSECTS IN THE BIOLOGICAL CONTROL OF SILKY HAKEA

by S. NESER and R.L. KLUGE
Subdivision Weeds
Plant Protection Research Institute, Stellenbosch

Silky hakea (*Hakea sericea*) is a native of South-Eastern Australia, and is but one of various Australian plants that have become weeds in South Africa.

Most weeds are alien to the country in which they have become a problem; they are rarely weeds in their countries of origin. Biological control simply aims to re-stablish the "normal" level of abundance of an alien plant in its new environment by introducing some of the specialised natural enemies, in this case insects, which help to "control" it in its native environment. Specialised natural enemies are organisms that have evolved and become so adapted to a particular plant, that

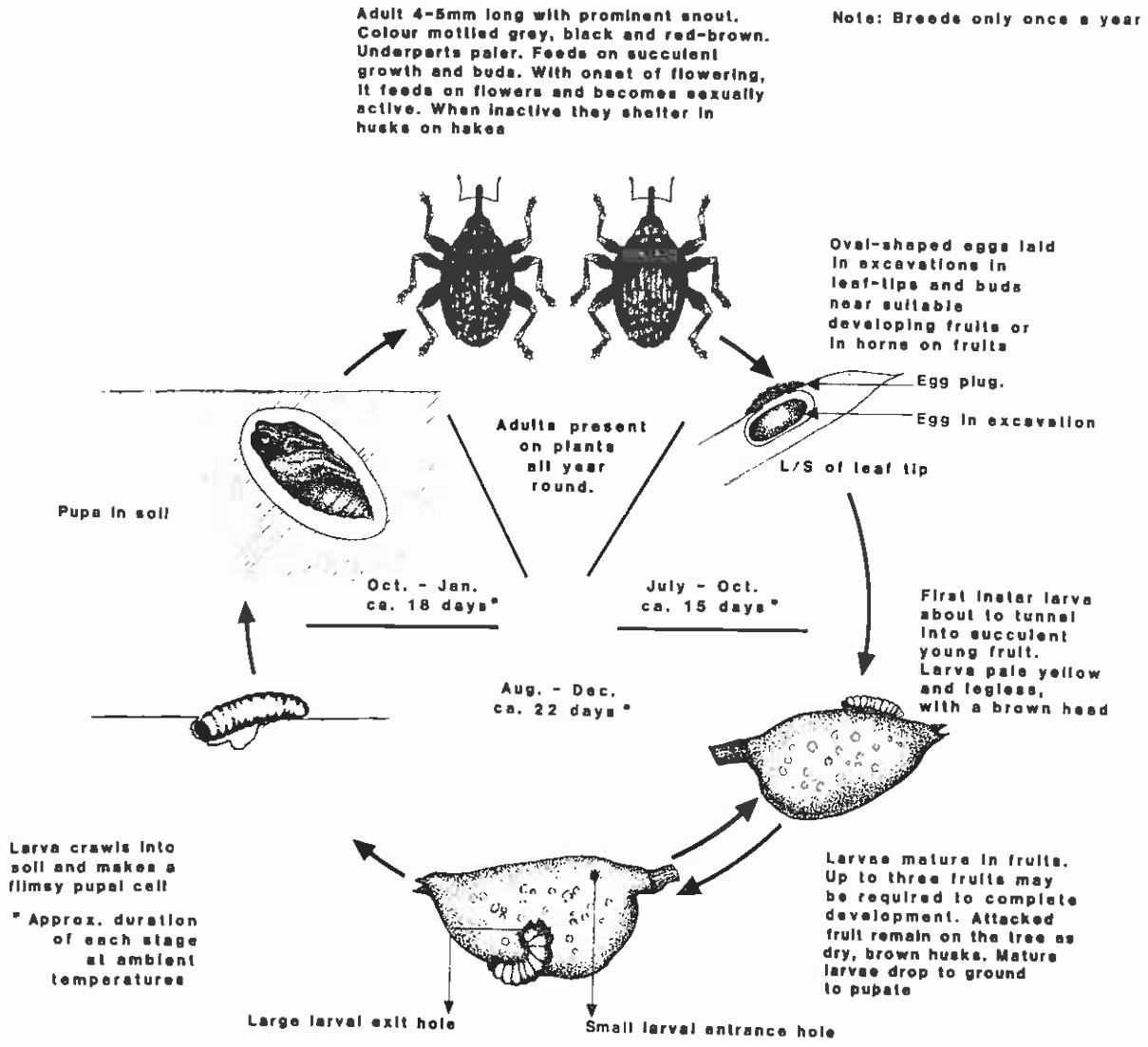

FIG. 1 - The life cycle of the hakea fruit weevil *Erytenna consputa*

FIG. 2 - Twig of silky hakea (*Hakea sericea*) showing one normal, mature fruit and three smaller, dry husks (in which larvae of the hakea fruit weevil developed, and in which adult weevils usually shelter)

they are unable to survive on any other. If the host plant becomes scarcer or ceases to exist, so do its specialised natural enemies.

Progress with the biological control of silky hakea

Three of the many known insect enemies of silky hakea have been imported and established in South Africa. These are the hakea fruit weevil, *Erytenna consputa*, the hakea seed moth *Carposina autologa* and the hakea leaf weevil, *Cydmaea binotata*.

Since 1972 approximately 8 000 hakea fruit weevils have been released in South Africa throughout the silky hakea infested areas. The weevils now occur in and around approximately 150 specially protected breeding colonies or "hakea reserves". As a result of fruit weevil attack, fruit production of silky hakea has already been reduced by up to 80% in some of these reserves. The next step now is to spread the weevils as widely among these reserves as possible; it is here that the assistance of foresters and the interested public would be invaluable.

Small numbers of the hakea seed moth were introduced at the same time as the hakea fruit weevil, but do not appear to have established. The third insect, the hakea leaf weevil, was released more recently, and good colonies have been established in the field.

The effect of biological control on silky hakea stands

The main impact of the insects will be on the seed production of silky hakea, so that biological control will have no apparent effect on existing hakea stands. These will still have to be removed by other methods such as felling. The effect of the insects on the density of hakea should, however, become evident in subsequenct generations of the weed. By reducing the seed production of the silky hakea plants, the insects will also help to limit the rate of spread of the weed; this will help reduce the risk of re-infestation of areas that have already been cleared.

The hakea fruit weevil

The life cycle of the hakea fruit weevil is described in Fig. 1.

To locate the fruit weevil in the field, it is easiest to first look for the husks, i.e. the dried, partially split remains of immature fruits resulting from larval attack (Fig. 2). These husks are distinguised from other aborted husks that may be present on the tree by the small larval entrance and exit hole in the fruit wall, and the larval frass which is often visible in the seed cavity. Although the adults are present on the trees throughout the year (they may live for 2-3 years), they are not readily seen; this is partly due to their cryptic colouring, their habit of dropping from the trees or flying off when disturbed, and also because they spend a great deal of their time sheltering, mainly in the husks.

The adult hakea fruit weevils may be collected in one of two ways. The first is by simply picking husks and dropping them into a plastic bag. To start with this may be done indiscriminately, but with time one soon develops a "feel" for the size and shape of husks that the weevils prefer to shelter in. As the weevils become active they leave the

husks and tend to congregate at the top of the bag. About 700 husks may be picked by one person in an hour. In an established colony this could yield at least 60 weevils, although this varies. Collecting with this method on hot days or during the breeding season would be less successful, as the adults are more likely to be active and out feeding. The bag of husks with adults may then be scattered in an uninfested stand of silky hakea.

With the second method a hakea branch is held over some kind of sheet, e.g. a ground sheet, and then jarred or beaten with a stick. The hakea fruit weevil adults, feigning death, drop onto the sheet and are easily collected. It is important to handle the branch or tree carefully before it is beaten so as not to alarm the weevils prematurely. This method is more successful during hot days when the weevils are very active.

A new hakea fruit weevil colony can in theory be started with a single mated female, although 20 adults per release should be taken as a minimum. The weevils should be kept cool, and must be released within 2 days of being collected. Collecting should preferably only be done between February and June, when the more vulnerable larval and pupal stages are not present.

The hakea seed moth

The life cycle of the hakea seed moth is described in Fig. 3.

It is extremely difficult to find or follow the life cycle of this insect in the field, as the moths are cryptic, the greater part of the larval stage is spent in the fruit, and the pupae occur in the ground. There are only two practical indicators of hakea seed moth activity that can be used in the field: these are the eggs that are laid on the mature fruits, and the exit holes that are made by the mature larvae when they leave the fruits to pupate. To find these, however, still requires very careful searching. Mature fruits that have been attacked by the hakea seed moth do not dehisce and remain "alive" on the tree, even though they no longer contain seeds. An attacked fruit is therefore indistinguishable from a healthy fruit except for the small exit hole. Initially hakea seed moth activity is highest in the lower parts of the tree.

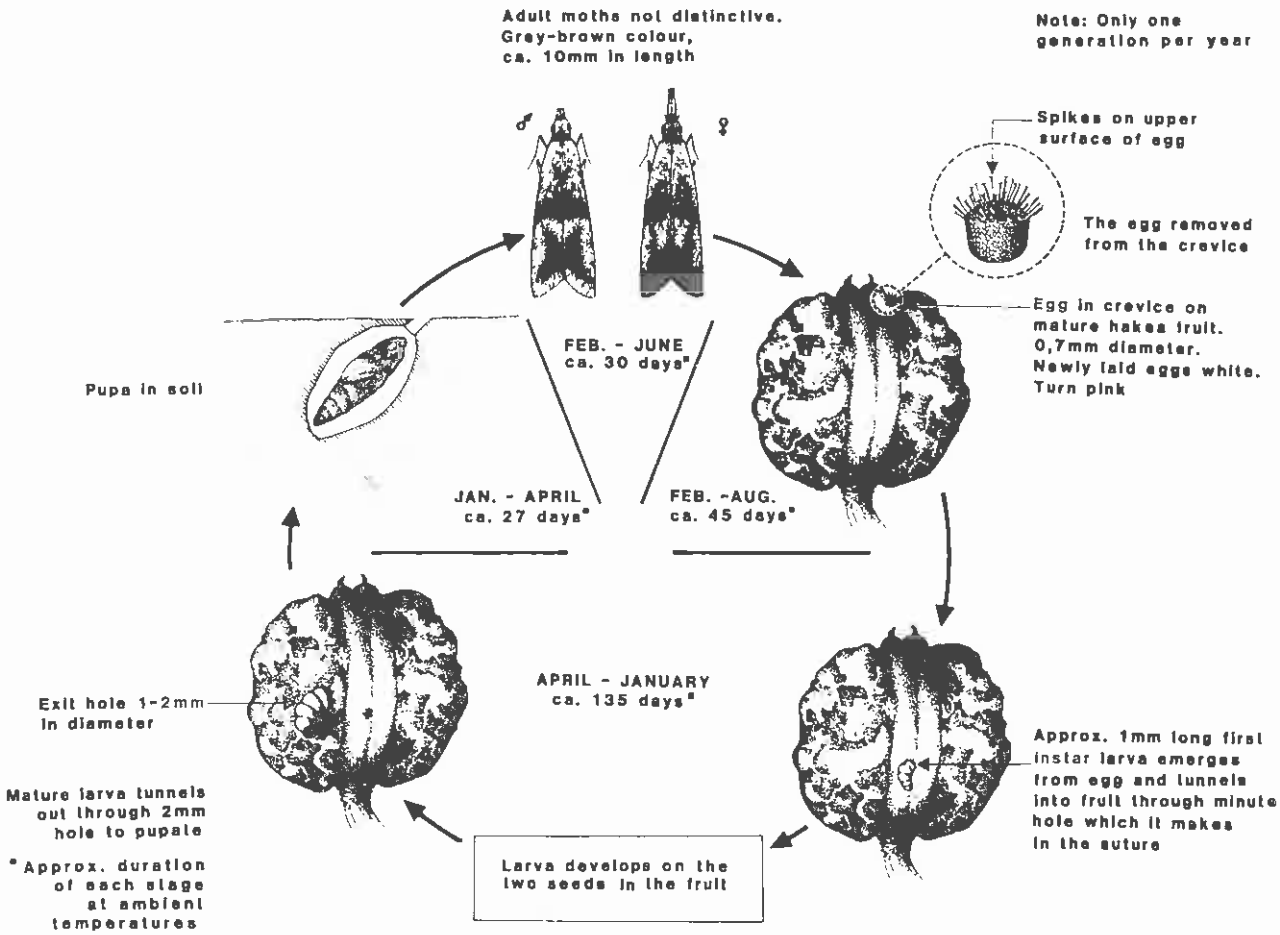

FIG. 3 - The life cycle of the hakea seed moth *Carposina autologa*

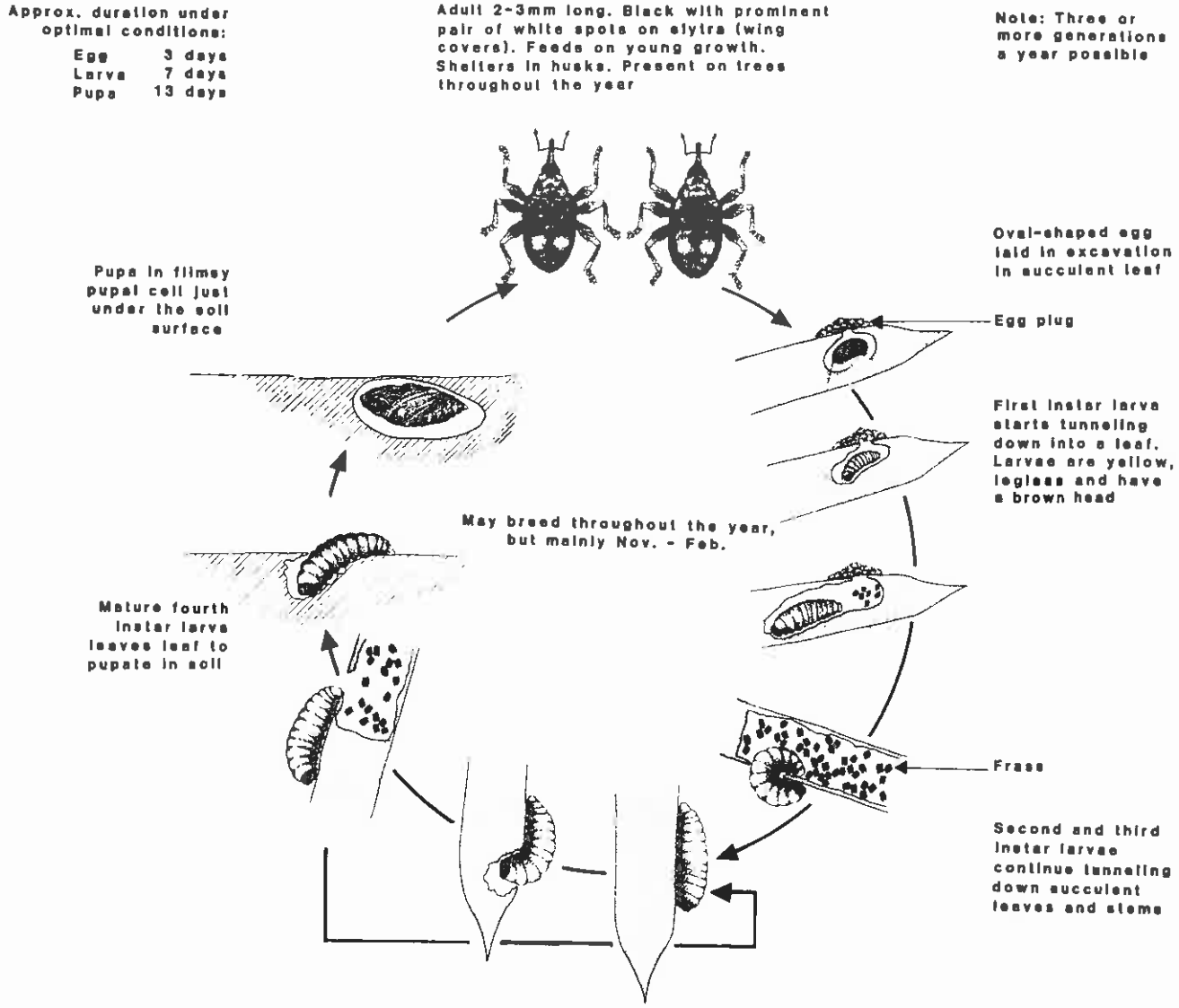

FIG. 4 - The life-cycle of the hakea leaf weevil *Cydmaea binotata*

The hakea leaf weevil

The life cycle of the hakea leaf weevil is described in Fig. 4.

Hakea leaf weevil activity can be detected by looking for scarred and stunted growth tips. The hollowed-out leaves resulting from larval feeding are also useful indicators of hakea leaf weevil activity. On hot days the adults are quite commonly seen running up and down the stems at the tips of the branches. The adults also shelter in the husks or between clusters of mature fruits towards the tips of the branches, and can therefore be collected together with the hakea fruit weevils in the husks or by beating.

A significant difference between this insect and the two described previously is that it attacks the vegetative and not the reproductive parts of the hakea plant. The feeding activity of both the adult and the larval stage is limited to the young succulent growth tips. This feeding can severely suppress seedling growth. The feeding injuries caused by the hakea leaf weevil and even by the hakea fruit weevil may also be important in increasing the vulnerability of the silky hakea plants to infection by the gummosis fungus disease, *Colletotrichum gloeosporioides*, which greatly aids biological control by the insects.

Printed and published in the Republic of South Africa by the Department of Agriculture and Water Supply and obtainable from the Directorate of Agricultural Information, Private Bag X144, Pretoria 0001

1987